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Dates of Tests: September 18 ~ 23, 2008
Test Report S/N: LR500190809A
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID.

WQWNL-LF100

APPLICANT

NESSLAB

Equipment Class	:	Part 15 Low Power Transmitter Below 1705kHz
Manufacturing Description	:	HID RFID Reader
Manufacturer	:	NESSLAB.
Model name	:	NL-LF100
Test Device Serial No.:	:	Identification
Rule Part(s)	:	FCC Part 15.209 Subpart C; ANSI C-63.4-2003
Frequency Range	:	125kHz
RF power	:	2.01 uV/m @ 300m
Data of issue	:	September 23, 2008

This test report is issued under the authority of:

The test was supervised by:

Dong -Min JUNG, Technical Manager

Kyung-Taek LEE, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.



NVLAP LAB Code.: 200723-0

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1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822
 Web site : <http://www.ltalab.com>
 E-mail : chahn@ltalab.com
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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2008-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2009-06-20	EMC accredited Lab.
FCC	U.S.A	610755	2011-04-22	FCC filing
VCCI	JAPAN	R2133, C2307	2011-06-21	VCCI registration
IC	CANADA	IC5799	2010-05-03	IC filing

2. Information's about test item

2-1 Client

Company name : NESSLAB
Address : 489-2, Maetan 3-dong, Yeong Tong-gu, Suwon-si, Gyeonggi-do Korea
Tel / Fax : +82-31-206-1774 / +82-31-206-1780

2-2 Equipment Under Test (EUT)

Trade name : **HID RFID Reader**
Model name : NL-LF100
Serial number : Identification
Date of receipt : September 17, 2008
EUT condition : Pre-production, not damaged
Antenna type : Loop Coil Antenna
Frequency Range : 125kHz
RF output power Range : 2.01 uV/m @ 300m
Power Source : 5VDC by main system

2-3 Tested frequency

	LOW	MID	HIGH
Frequency (kHz)	-	125	-

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.203	Antenna Requirements	-	-	C
15.209	Field Strength of Fundamental	-	Radiated	C
15.209 / 15.109	Field Strength of Harmonics	-	Radiated	C
15.207 / 15.107	AC Conducted Emissions	EN 55022	Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:

FCC Parts 15.209; ANSI C-63.4-2003

→ Antenna Requirement

The NESSLAB. NL-LF100 unit complies with the requirement of §15.203.

Refer to the Internal photo

3.2 TECHNICAL CHARACTERISTICS TEST

3.2.1 Field Strength of Fundamental and Harmonics

Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10th harmonic.

RBW = 100 kHz (<1 GHz)

VBW ≥ RBW

= 1 MHz (> 1 GHz)

Detector function = peak / Average power

Sweep = auto

Measurement Data: - Refer to the next page

Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m)	Distance (m)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

** Limit: $2400/125 = 19.2 \text{ uV/m @ } 300\text{m}$

** Sample Calculation

Result Level = Level + T.F– Distance Correction Factor

T.F = Antenna Factor + Cable loss

Distance Correction Factor = $40\log(\text{specific distance} / \text{test distance})$

Measurement Data:**1. Fundamental**

Freq. (kHz)	Level(dBuV)		T.F	Dis. C.F	Result(dBuV)@300m		Result(uV)@300m	
	PK	AV	dB	dB	PK	AV	PK	AV
126.2	90.23	87.97	-1.9	80	8.33	6.07	2.61	2.01

2. Harmonics

Har	Freq.	Level(dBuV)		T.F	Dis. C.F	Result(dBuV)@300m		Result(uV)@300m	
	(kHz)	PK	AV	dB	dB	PK	AV	PK	AV
3	378.75	61.79	59.51	-1.93	80	-20.14	-22.42	0.10	0.08
5	629.25	53.21	50.87	-1.93	80	-28.72	-31.06	0.04	0.03
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

3. Emission



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EUT/Model No.: NL-LF100

TEST MODE: NORMAL mode

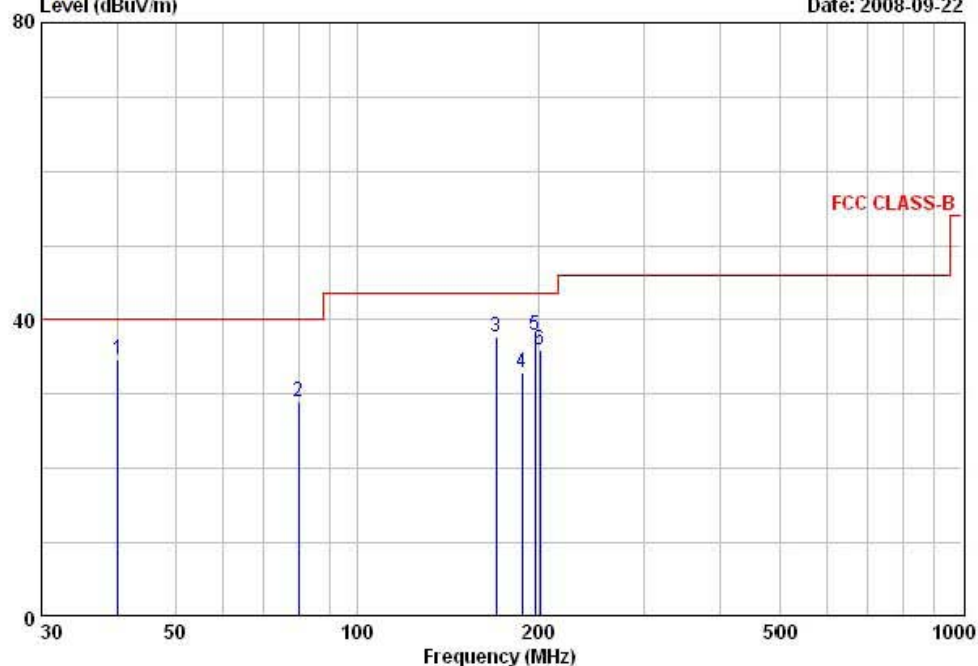
Temp Humi : 24 / 76

Tested by: KIM.B.S

Data: 100

Level (dBuV/m)

Date: 2008-09-22



	Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
	MHz	dBuV	dB	QK dBuV/m	dBuV/m	dB	cm	deg	
1	40.22	47.30	-12.73	34.57	40.00	5.43	100	225	VERTICAL
2	80.05	45.30	-16.29	29.01	40.00	10.99	100	105	VERTICAL
3	170.30	48.30	-10.54	37.76	43.50	5.74	152	215	HORIZONTAL
4	187.86	45.20	-12.27	32.93	43.50	10.57	100	362	VERTICAL
5	197.37	50.80	-12.97	37.83	43.50	5.67	173	225	HORIZONTAL
6	201.40	49.10	-13.07	36.03	43.50	7.47	152	332	HORIZONTAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

3.2.2 AC Conducted Emissions

Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Measurement Data: Complies

- See next pages for actual measured spectrum plots.
- No other emissions were detected at a level greater than 10dB below limit.

Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

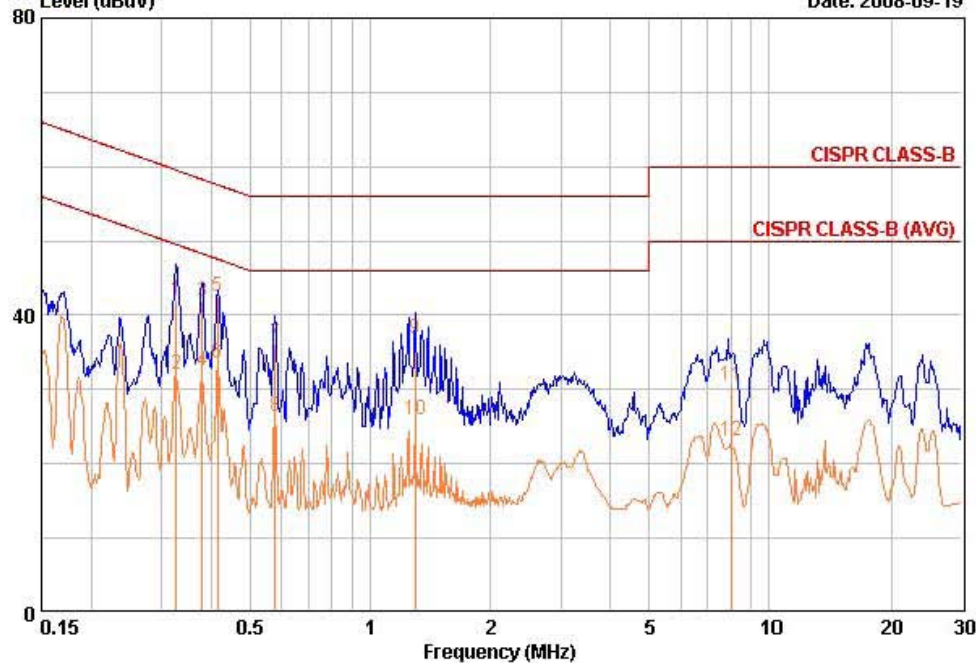
AC Conducted Emissions / Line



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EUT / Model No. :	NL-LF100	Phase	: LINE
Test Mode	: NORMAL mode	Test Power	: 120 / 60
Temp./Humi.	: 25 / 48	Test Engineer	: B.S.KIM

Data: 58 File: E:\00_e3 EMI DATA\2008\LTA_Conduction_0809_3.EMI (80) Date: 2008-09-19



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.326	32.50	22.40	9.55	42.05	31.95	59.55	49.55	17.50	17.60
0.380	32.20	22.90	9.57	41.77	32.47	58.28	48.28	16.51	15.81
0.414	33.00	24.00	9.57	42.57	33.57	57.57	47.57	14.99	13.99
0.578	26.60	16.80	9.61	36.21	26.41	56.00	46.00	19.79	19.59
1.294	27.10	16.10	9.79	36.89	25.89	56.00	46.00	19.11	20.11
8.018	20.50	13.10	9.96	30.46	23.06	60.00	50.00	29.54	26.94

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

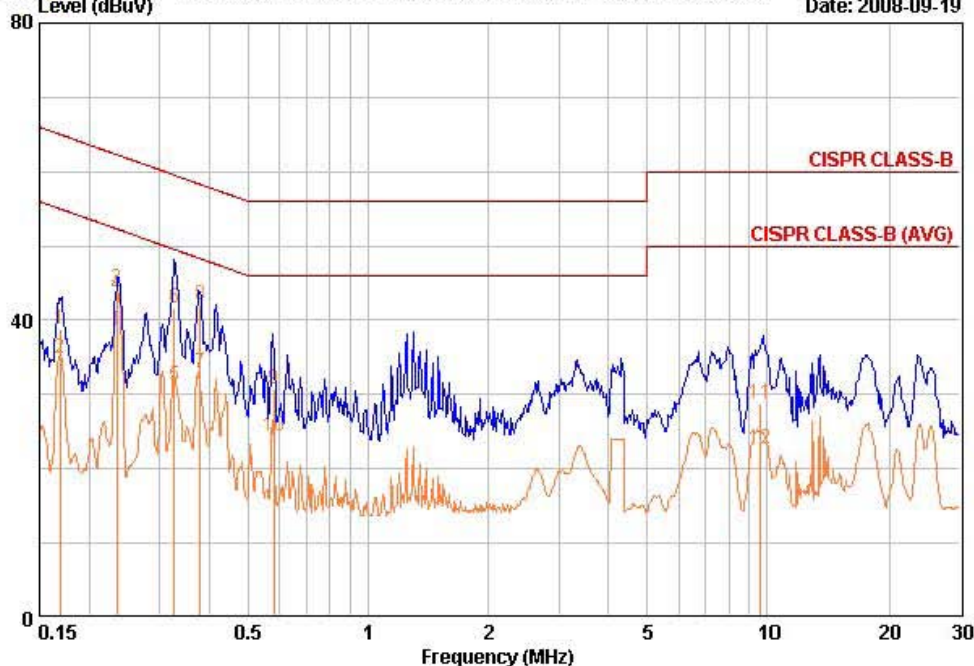
AC Conducted Emissions / Neutral



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EUT / Model No. : NL-LF100	Phase : NEUTRAL
Test Mode : NORMAL mode	Test Power : 120 / 60
Temp./Humi. : 25 / 48	Test Engineer : B.S.KIM

Data: 60 Level (dBuV) File: E:\00_e3 EMI DATA\2008\LTA_Conduction_0809_3.EMI (80) Date: 2008-09-19



Freq	RD	RD	C.F	Result	Result	Limit	Limit	Margin	Margin
MHz	QP	AV		QP	AV	QP	AV	QP	AV
	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV	dB	dB
0.169	29.20	25.30	9.64	38.84	34.94	65.01	55.01	26.17	20.07
0.234	34.70	33.80	9.52	44.22	43.32	62.31	52.31	18.08	8.98
0.327	32.00	21.70	9.55	41.55	31.25	59.53	49.53	17.98	18.28
0.379	32.50	23.40	9.56	42.06	32.96	58.30	48.30	16.24	15.34
0.579	21.20	14.80	9.61	30.81	24.41	56.00	46.00	25.19	21.59
9.550	18.80	12.50	10.07	28.87	22.57	60.00	50.00	31.13	27.43

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

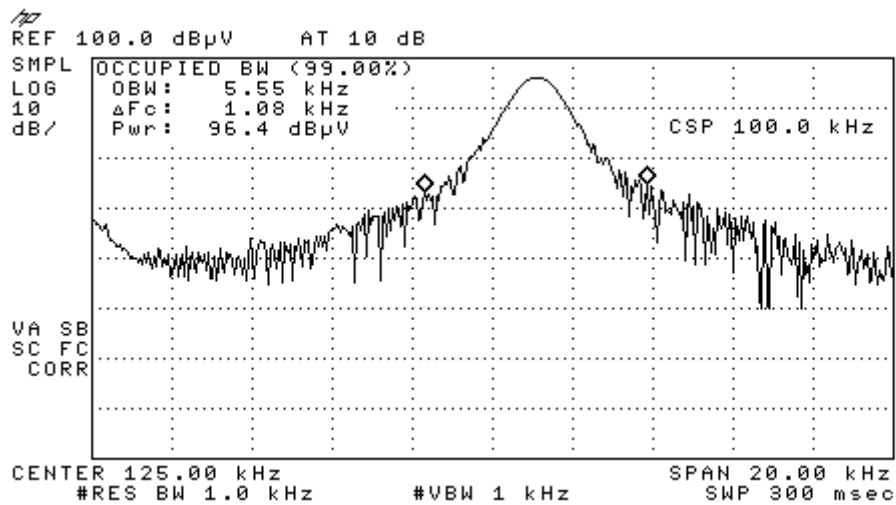
APPENDIX 1

TEST EQUIPMENT USED FOR TESTS

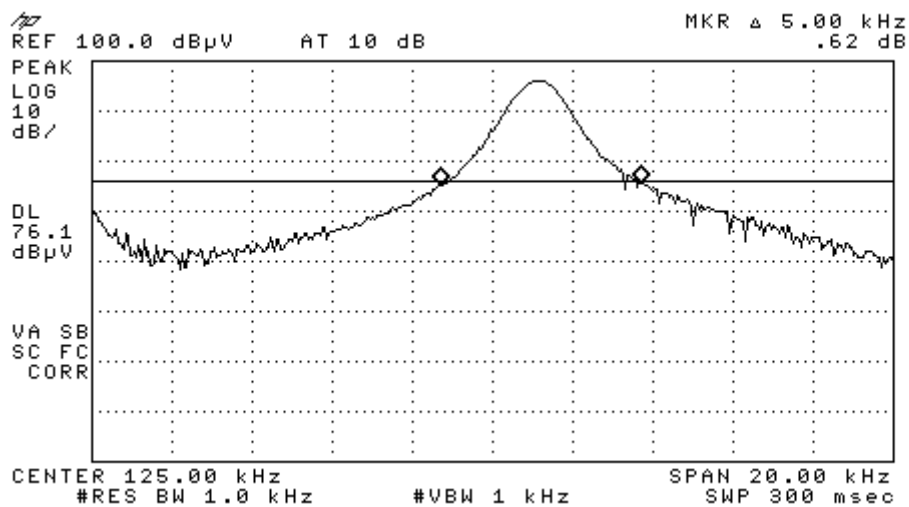
	Description	Model No.	Serial No.	Manufacturer	Next Cal. Date
1	Spectrum Analyzer	8594E	3649A03649	HP	Apr-09
2	Signal Generator	8648C	3623A02597	HP	Apr-09
3	Attenuator (3dB)	8491A	37822	HP	Oct-08
4	Attenuator (10dB)	8491A	63196	HP	Oct-08
5	EMI Test Receiver	ESVD	843748/001	R&S	Aug-09
6	LISN	KNW-407	8-1430-1	Kyoritsu	Jan-09
7	Two-Line V-Network	ESH3-Z5	893045/017	R&S	Oct-08
8	RF Amplifier	8447D	2949A02670	HP	Jan-09
9	RF Amplifier	8447D	2439A09058	HP	Oct-08
10	RF Amplifier	8449B	3008A02126	HP	Apr-09
11	Test Receiver	ESHS10	828404009	R&S	Aug-09
12	TRILOG Antenna	VULB 9160	9160-3212	SCHWARZBECK	Jul-09
13	Log.-Per. Antenna	VULP 9118	9118 A 401	SCHWARZBECK	Apr-09
14	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	Apr-09
15	Horn Antenna	3115	00055005	ETS LINDGREN	Mar-09
16	Dipole Antenna	VHA9103	2116	Schwarzbeck	Nov-08
17	Dipole Antenna	VHA9103	2117	Schwarzbeck	Nov-08
18	Dipole Antenna	UHA9105	2261	Schwarzbeck	Nov-08
19	Dipole Antenna	UHA9105	2262	Schwarzbeck	Nov-08
20	Spectrum Analyzer	8591E	3649A05888	HP	Oct-08
21	Spectrum Analyzer	8563E	3425A02505	HP	Apr-09
22	Hygro-Thermograph	THB-36	0041557-01	ISUZU	Apr-09
23	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	Jun-09
24	RF Switch	MP59B	6200414971	ANRITSU	Jun-09
25	RF Switch	MP59B	6200438565	ANRITSU	Jun-09
26	Power Divider	11636A	6243	HP	Oct-08
27	DC Power Supply	6622A	3448A03079	HP	Oct-08
28	Attenuator (30dB)	11636A	6243	HP	Oct-08
29	Frequency Counter	5342A	2826A12411	HP	Apr-09
30	Power Meter	EPM-441A	GB32481702	HP	Apr-09
31	Power Sensor	8481A	2702A64048	HP	Apr-09
32	Audio Analyzer	8903B	3729A18901	HP	Oct-08
33	Modulation Analyzer	8901B	3749A05878	HP	Oct-08
34	TEMP & HUMIDITY Chamber	YJ-500	L05022	JinYoung Tech	Oct-08
35	LOOP-ANTENNA	FMZB 1516	151602/94	SCHWARZBECK	Mar-09
36	Stop Watch	HS-3	601Q09R	CASIO	Apr-09

APPENDIX 2

OCCUPIED BANDWIDTH

99% Bandwidth

L

20dB Bandwidth

L